much research is needed on this topic, such data and investigation would be a very worthwhile and significant contribution.

RELIABILITY-BASED PIER SCOUR ENGINEERING[a]

Discussion by Che-Hao Chang[2] and Yeou-Koung Tung[3]

In the "Model Calibration" section of the paper, the author presented, in Table 3, the correlation matrix for scour parameters. It is not clear to the discussers that these correlation characteristics of scour parameters are considered in the Monte Carlo simulation. It appears to us that the author, in the simulation, treated these scour parameters as independent random variables. If that is the case, what is the justification for doing so? Some parameters have fairly high correlation such as flow depth y and sediment gradation σ. Without properly taking into account the presence of correlation among parameters, (15)–(17) based on Monte Carlo simulation results are questionable in their applications and assessment of the reliability.

Furthermore, the application example given by the author using (16) to assess scour risk in different site conditions is misleading and erroneous. The failure probability versus safety-factor curve, shown by Fig. 3, is developed under the condition of mean scour parameters stated in the beginning of the "Application" section along with the distributions and coefficients of variation given in the "Random Variables" section. Changes made to any of these properties of the involved random variables would alter the distributional properties of the scour depth. Note that (16) was established on the basis of the preceding specified condition. It can only be applied to the same condition under which the equation is developed. The author incorrectly applied (16) to a bridge site with different stochastic properties for the scour parameters. Hence, (17) is not valid for the new application site. As can be seen, the results from a Monte Carlo simulation are site specific, which, in general, cannot be transferred to other site conditions. Even if nondimensionalized scour parameters are used in (5), simulation results are conditioned on the probabilistic properties of nondimensionalized parameters.

Closure by Peggy A. Johnson[4]

The writer thanks the discussers for their interests and comments. The scour parameters were treated as independent random variables. Although parameters such as flow depth and sediment gradation are correlated in this

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[a] October, 1992, Vol. 118, No. 10, by Peggy A. Johnson (Paper 1678).

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set of laboratory data, they are not necessarily so strongly correlated in the field. In fact, the data in Table 1 clearly show that it is the experimental program that is responsible for this correlation. In addition, the tremendous uncertainty involved in predicting scour depths very likely overshadows this problem.

It is correct that the results are site specific. However, at another site under similar conditions, for example at a bridge on the same river with the similar flow conditions, the same equation could be applied with no significant loss of accuracy.

MODELING OF RECTANGULAR SETTLING TANKS[a]

Discussion by Willi H. Hager,[3] Member, ASCE, and Judith Ueberl[4]

The discussers would like to congratulate the authors for their paper on rectangular settling tanks. It refers not to settling tanks in general, but to final settling, as outlined in the introduction and, therefore, involves a density current. The purpose of this discussion is to outline certain shortcomings of the present computational model as compared to prototype observations.

The discussers conducted experiments in a rectangular final settling tank 50 m long, 7.5 m wide and decreasing depth from 3.30 m at the inlet to 2.7 m at the outlet. The approach flow from the aeration tanks occurs through transposed vertical slit elements of 2.5 m height, just above the sludge decanters. In total there are 11 outflow sections each 0.2 m wide. The tank has a counter-current sludge removal system and four transverse surface take-off channels at locations 16 m, 26 m, 36 m, and 46 m from the inlet section.

Some thirty experiments have been conducted for the tank design discharge $Q_D = 80$ L/s, as well as for $Q_D/2$ and $Q_D/4$. The height of approach slots was varied by reducing the slot opening to 1.5 m and the experiments in a future series refer to a slot height 0.5 m. Also, combinations with various outlet channels were studied, i.e. either all four channels, or the first two, or even the last two in operation only.

The experimental procedure is essentially as described by Bretscher et al. (1992), except that velocity and density observations were conducted at three longitudinal sections, plus two intermediate sections close to the inlet. Further, temperature and oxygen distributions along the tank axis were also recorded. A specific experiment lasts approximately 4 h, and a total of 450 single readings are taken. Care is taken that all parameters remain more or less constant during the observational period. After the experiment, additional biological and chemical parameters are collected.

Fig. 14(*a*) relates to run L3 with $Q = 40$ L/s for a slot height $s = 2.5$ m. Typical flow is seen to occur on the right tank side, with a bottom forward

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[a] October, 1992, Vol. 118, No. 10, by Siping Zhou and John A. McCorquodale (Paper 1816).

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